**Citation:**

van Asselt ED, de Jong AE, de Jonge R, Nauta MJ. Cross-contamination in the kitchen: Estimation of transfer rates for cutting boards, hands and knives. *J Appl Microbiol.* 2008 Nov; 105(5): 1,392-1,401. Epub 2008 Aug 18.

**PubMed ID:** 18713282

**Study Design:**

Meta-analysis / Quantitative risk assessment

**Class:**

M - Click here for explanation of classification scheme.

**Research Design and Implementation Rating:**

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To quantify cross-contamination in the home from chicken to ready-to-eat salad.

**Inclusion Criteria:**

None specified.

**Exclusion Criteria:**

None specified.

**Description of Study Protocol:**

**Design**

Meta-analysis/Quantitative risk assessment.

**Intervention**

- It was assumed that cross-contamination in the recipe is only possible through hands, knives and cutting boards
- Various cross-contamination scenarios were tested in the laboratory
- Scenarios in which one item was studied (washed with or without soap or not washed) and scenarios in which all items were either were decontamination between cutting raw chicken and the salad (best-case scenario); each scenario was repeated at least four times.

**Statistical Analysis**

- The effect of washing the various items was tested for its significance with ANOVA on the

log-transformed data in SPSS. A significance level of 0.05 was used
- The number of bacteria found in the prepared salad depended both on the number of bacteria transferred through cross-contamination and the number of bacteria surviving the cooking step
- Transfer rates were based on the number of surviving bacteria in the final salad, as determined by de Jong et al (2008), both for *Campylobacter jejuni* and *Lactobacillus casei*. Only initial and end point cell number were measured ($N_S$ and $N_O$), and none at points in between
- Based on these measurements, only overall transfer rates could be estimated (i.e., the multiplication of bacteria and not separate parameter values)
- Transfer rates were estimated using Monte Carlo simulations in @Risk software with 100 iterations.

**Data Collection Summary:**

**Timing of Measurements**

The chicken curry recipe consisted of the following:

- First cut a chicken breast fillet in half (by which the chicken can contaminate various items), then boil it in water for 10 minutes
- Cut the chicken to smaller pieces, cut the fruit and add spices and cream.

**Dependent Variables**

Cross-contamination of *Campylobacter jejuni* and *Lactobacillus casei.*

**Independent Variables**

- It was assumed that cross-contamination in the recipe was only possible through hands, knives and cutting boards
- Various cross-contamination scenarios were tested in the laboratory
- Scenarios in which one item was studied [i.e., washed with or without soap or not washed(worst-case scenario) or scenarios in which all items were either decontaminated between cutting raw chicken and the salad (best-case scenario)]; each scenario was repeated at least four times.

**Description of Actual Data Sample:**

- *N:* Number of laboratory results unclear
- *Location:* The Netherlands.

**Summary of Results:**

**Key Findings**

- This study showed that the transfer characteristics for both micro-organisms were comparable when washing regimens and transfer via items (cutting boards, hands and knives) were compared
- Cross-contamination by hands, cutting boards and knives were equally important

- Applying good hygiene practices resulted in final levels of bacteria in the salad below the detection limits. This study showed that it is important to include these data points in model fitting.

**Author Conclusion:**

- Results obtained in observational studies with *Lactobacillus casei* can be translated to *Campylobacter jejuni* using the transfer rates obtained in this study
- Cross-contamination by hands, cutting boards and knives was equally important.

***Reviewer Comments:***

*Number of laboratory results was unclear. Inclusion and exclusion criteria were not described.*

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***Research Design and Implementation Criteria Checklist: Review Articles***

| **Relevance Questions** | | |
|---|---|---|
| 1. | Will the answer if true, have a direct bearing on the health of patients? | Yes |
| 2. | Is the outcome or topic something that patients/clients/population groups would care about? | Yes |
| 3. | Is the problem addressed in the review one that is relevant to nutrition or dietetics practice? | Yes |
| 4. | Will the information, if true, require a change in practice? | Yes |

| **Validity Questions** | | |
|---|---|---|
| 1. | Was the question for the review clearly focused and appropriate? | Yes |
| 2. | Was the search strategy used to locate relevant studies comprehensive? Were the databases searched and the search termsused described? | No |
| 3. | Were explicit methods used to select studies to include in the review? Were inclusion/exclusion criteria specified and appropriate? Were selection methods unbiased? | No |
| 4. | Was there an appraisal of the quality and validity of studies included in the review? Were appraisal methods specified, appropriate, and reproducible? | No |
| 5. | Were specific treatments/interventions/exposures described? Were treatments similar enough to be combined? | Yes |
| 6. | Was the outcome of interest clearly indicated? Were other potential harms and benefits considered? | Yes |

| | | |
|---|---|---|
| 7. | Were processes for data abstraction, synthesis, and analysis described? Were they applied consistently across studies and groups? Was there appropriate use of qualitative and/or quantitative synthesis? Was variation in findings among studies analyzed? Were heterogeneity issued considered? If data from studies were aggregated for meta-analysis, was the procedure described? | Yes |
| 8. | Are the results clearly presented in narrative and/or quantitative terms? If summary statistics are used, are levels of significance and/or confidence intervals included? | Yes |
| 9. | Are conclusions supported by results with biases and limitations taken into consideration? Are limitations of the review identified and discussed? | Yes |
| 10. | Was bias due to the review's funding or sponsorship unlikely? | Yes |